Letters to the Editor

The ecoinvent Database

Reply to the Letter to the Editor of Schmidt & Jensen [Int J LCA 10 (2) 97]

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DOI: http://dx.doi.org/10.1065/lca2005.03.002

Schmidt & Jensen (2005) put forward two discussion points related to the Int J LCA 10 (1) 2005 that was dedicated to the release of the ecoinvent Database. The two discussion points are:

1. allocation approach used in recycling
2. waste treatment modelling in ecoinvent

We will give answers to these two aspects and invite others to comment on them.

1 Allocation Approach Used in Recycling

Like correctly stated by Schmidt & Jensen (2005), we applied the cut-off approach for post-consumer wastes that are recycled, i.e. secondary materials do not bear any burdens other than those caused by collection, purification and/or processing. The reasons why the cut-off approach for post-consumer recycling has been implemented in the ecoinvent database are described in Frischknecht et al. (2004) and will not be repeated here. The authors question this approach by asking whether it is always in accordance with the actual consequences for the environment.

Schmidt & Jensen (2005) describe another way of thinking, namely the 'market-based' approach, and illustrate it with a study of the situation of the recycled paper market. They ask themselves whether it is possible to adapt ecoinvent data according to other national methodologies, other opinions and choices.

The ecoinvent data are offered on a unit process level and therefore are adaptable to other national methodologies and differing opinions. The inputs of raw materials or semi-finished products may be changed (from recycled to virgin paper for instance), the avoided burden approach may be applied by introducing negative product outputs, etc.

We like to emphasise, however, that such changes should be done with great care. One crucial requirement, though, is that the environmental performance of all products involved (in the cited example: primary and secondary paper made from different feedstocks, different kinds of insulation materials) should in any case be analysed and compared to competing products in their respective markets. Such comparisons help to avoid problem shifting and cross subsidising between co-products and across product life cycles in material cascades.

A second requirement is that the allocation principles are applied consistently. We like to illustrate this with the example of modelling the recovery of used tyres in ecoinvent. Tyres that leave the transport service systems to be reused bear no upstream burdens of tyre manufacturing (cut-off). Consequently, the cement production burning used tyres as a secondary fuel gets the used tyres (nearly) burden-free.

2 Waste Treatment Modelling in Ecoinvent

When establishing a consistent LCI database that consists of a few thousands of unit process datasets, the application of some basic assumptions is indispensable. One of these assumptions is on the default modelling of waste treatment in case no information on the actual treatment is available[1]. According to the statistics in Appendix 5 of Symonds et al. (1999), a share of 70% landfilling and 30% recycling of concrete, bricks and tyles seems more appropriate for the European average than the 100% landfilling currently assumed in the ecoinvent database. A high variability among European nations can be observed, which suggests nationally differentiated modelling.

But where in the ecoinvent database did we use these end of life treatment assumptions? The assumptions are used in the infrastructure datasets such as power plants, factories and buildings. We considered it inappropriate to model the power plant's end of life treatment individually for each country. The influence of different end of life treatments of power plants on the cumulative LCI result of the electricity produced is too low compared to the additional effort required to model 25 country specific power plant construction and decommissioning datasets. We preferred to use the scarce human resources in the ecoinvent projects to model the *op-*

[1] Assuming, e.g., that inert materials such as concrete are sent to landfill, plastics are incinerated and metals (bulk amounts) go to recycling.

eration of the power plants as accurate as possible and on a country-specific level. A similar reasoning applies for the factories that contribute only little to the life cycle inventory results of materials produced in these factories.

The ecoinvent end of life treatment assumptions are fallback assumptions used in a database that offers background datasets of commonly used products and services. These assumptions are not meant to be used in every LCA based on ecoinvent background data. If, for instance, different types of buildings are analysed and compared (e.g. concrete versus steel versus wood based constructions) one should of course apply the most appropriate end of life scenario(s) that apply for the given situation and time horizon.

The waste treatment process datasets in the ecoinvent database are labelled as being Swiss (with the country code 'CH'). Again, limited resources made us assume, for example, that all waste incinerators in Europe and the world behave like Swiss incinerators, e.g. the plastics used in a European off-shore wind power plant are finally incinerated in a waste incineration plant with average Swiss technology of the year 2000.

But this does not mean that we encourage LCA practitioners to use the ecoinvent (Swiss) waste treatment service datasets in any case. The transparent models developed by Doka & Hischier (2004) make it possible to adapt the technology modelling to the country specific situation. For instance, one needs specific information on waste treatment technologies to evaluate the optimal waste policy in other countries like Denmark. However, if one of the waste treatment technologies to be evaluated requires caustic soda for its flue gas cleaning, the corresponding ecoinvent dataset 'sodium hydroxide, 50% in H_2O, production mix, at plant, RER, [kg]' (DS-ID 336) may well serve its purpose. It does hardly matter that the European electricity supply mix used to manufacture the caustic soda includes a few percent of wind power that includes plastics in its infrastructure that are finally incinerated in a 'Swiss' waste incinerator.

3 Outlook

The existence of the ecoinvent database cannot fully avoid data investigation activities and sensible modelling. Schmidt &Jensen (2005) point out an important issue, when they say that using the ecoinvent data without adaptations to the decision-making context may lead to sub-optimal solutions. However, the ecoinvent database efficiently supports LCA practitioners to complement their LCA studies with quality controlled and transparent LCI data. The appropriate application and potential adaptation of ecoinvent data is dependent on the goal and scope of the LCA study at issue and, in the case of allocation, on value choices as well. The extensive meta information (on technology, time, geography and the like) together with the unit process input and output raw data help the practitioner to judge the appropriateness and usefulness of each individual ecoinvent dataset.

The supply of fully transparent datasets on a unit process level gives a maximum of flexibility for the user to adjust datasets according to his or her needs and given circumstances. Some of the professional software products support such adaptations.

Let us answer the first question and conclude with a vision: Currently, several countries plan to establish their national or even regional LCI database. We consider it one efficient way towards such national databases to start with the EcoSpold format and the ecoinvent data v1.1 and investigate further datasets according to particular national or regional conditions and interests.

Within the capacity building efforts of the UNEP-SETAC life cycle initiative, the ecoinvent Centre thinks of special offers for national and regional networks such as the African LCA Network (ALCAN), the Indian Society for Life Cycle Assessment (ISLCA) and the Latin American Life Cycle Network. We invite you to contact us in case you would like to know more about the opportunities to establish your national LCA database based on the EcoSpold format and ecoinvent data v1.1.

References

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The ecoinvent database is the product of a long-term project: first ideas for a Swiss national LCI database root back in 1997. After intensive discussions, the pilot project started in June 1998, with the goal stated in the project description:

The aim of the project ecoinvent 2000 is to establish a common, future oriented life cycle inventory database for the whole ETH domain. The focus is therefore on a well-structured data warehouse for about 5'000 processes, a user-friendly interface to the database and a common data exchange format. In a second step, a harmonisation of the data shall be established in order to get a consistent backbone of data for the ETH domain.

(Institutes of the ETH domain: Swiss Federal Institute of Technology Zurich (ETHZ), Swiss Federal Institute of Technology Lausanne (EPFL), Paul Scherrer Institute (PSI), Swiss Federal Laboratories for Materials Testing and Research (EMPA), the Swiss Federal Institute for Environmental Science and Technology (EAWAG), and the Swiss Federal Institute for Forest, Snow and Landscape Research (WSL)).